upon the following morning the re-examination of the lanterns and press straps is made. With sufficient practice and regularity of this habit such matters take on a routine nature without so much as a disturbance of one's slumber.

Chicago Natural History Museum.

Postglacial Forest Succession, Climate and Chronology in the Pacific Northwest (A Review of the Study by Henry P. Hansen[1]).—Dr. Hansen presents in this paper the results of many years of painstaking investigation of peat deposits in the Pacific Northwest. Most of the data used have come from profiles of pollen-bearing strata located in western Washington and western Oregon, though some representative profiles were also made in the eastern parts of these states and in northern Idaho.

The paper will be of great value in the development of the study of pollen analysis in America, not only because of the care and thoroughness with which the work itself has been done, but also because of the skill utilized by the author in placing the many profiles studied in their proper topographic and geographic positions. One of the criticisms that can be leveled against much of the pollen analytical work done in America has been the lack of its proper correlation with the physiographic history of the regions involved.

Volcanic eruptions in the Northwest coastal area during postglacial time have caused the deposition of ash over wide areas. The precise dates of the eruptions are not fixed, but Prof. Hansen has used the ash layers to very good advantage as points of correlation among his various peat profiles.

The paper as a whole is divided into 13 chapters or sections, with an extensive list of references and an index at the end. The chapters fall into three groups, the first of which contains introductory and general descriptive matter. The second consists of an analysis of the various profiles studied, in terms of general postglacial vegetational history. Finally, there is the author's discussion of his findings as they indicate postglacial climate and chronology.

Following acknowledgments and introduction, there is a brief history of pollen analysis and a discussion of the theories upon which it rests. Then comes an account of the geologic origins and ages of land surfaces in the Pacific Northwest. In this and the following chapter, which is on pollen-bearing profiles of the Pacific Northwest, the geographic subdivisions for the entire discussion are set up. These subdivisions are looked upon as natural areas. They "approximate physiographic divisions, but they are delimited largely upon the basis of homogeneity of vegetation and climate, and to some extent by the geologic history." The natural areas are: Olympic Mountains, Coastal Strip, Klamath-Siskiyou region, Oregon Coast Range, Puget-Willamette lowland, Cascade Mountain range, Northern Great Basin, Blue Mountains, Columbia Basin, and the region of northeastern Washington and northern Idaho.

The next two chapters deal with the late-glacial and post-glacial chronology of the region and with the probable rate of organic deposition in various areas. In a chapter on methods and technique, the author explains with great care his methods of collecting and preparing samples, and outlines the technique of sampling used in his statistical studies of fossil pollens. Perhaps the most important part of this chapter is concerned with the much debated problem of the identification of the pollens. The author makes free use of the size-range method of checking fossil pollen identification, and utilizes size-frequency

[1] Trans. Amer. Phil. Soc. N. S. Vol. 37, Pt. 1: 1–130. 114 text figures, map. 1947. $2.25.

charts for the identification of the pollens of pines, firs, and spruces. Certain common conifers of the Northwest coast are not well represented in the profiles due to the poor preservation of their pollens. Such are the western red cedar (*Thuja plicata*), Port Orford cedar (*Chamaecyparis Lawsoniana*), Alaska cedar (*C. nootkatensis*), incense cedar (*Libocedrus decurrens*), redwood (*Sequoia sempervirens*), and western juniper (*Juniperus occidentalis*). Following the discussion of methods, there is a chapter on the climatic features of the Pacific Northwest outlined in terms of the major natural areas.

The final two chapters in the first group are devoted first to a general classification and description of the forest types of the region; and second, to a description of the general ecology of the principal species in the forests. The second of these chapters is an excellent addition to the book and sets a precedent for future studies of this kind. One could wish that the treatment given each species could have been more complete.

The postglacial vegetational history is outlined geographically according to the principal natural areas. Pollen profiles are given for the various peat sections studied, many of them composite curves showing the frequency distribution of individual species in several of the sections. Those who have tried to do this sort of work will appreciate the extraordinary amount of painstaking labor that has gone into the making of the diagrams.

The final chapter of the discussion begins with a general statement of the problem of correlation between climate and vegetation, and of the problem of setting up a chronology to fit the sequence of events. There is a brief summary of earlier schemes, such as those of Blytt and Sernander, De Geer, von Post, and Antevs. An attempt is made, with only partial success, to correlate eastern North American and Northwest coast chronologies. The author's findings tend to support the von Post hypothesis, which postulates a period of increasing warmth following the disappearance of the ice, a period of warmth in which temperatures were greater than those of today, and a period of decreasing warmth to the present. The period of greatest warmth, commonly known as the postglacial optimum, he sets between 8000 and 4000 years ago. His interpretation of postglacial events in the development of climates, vegetation, and human occupance appears to show reasonably good correlations among its various parts.

The hazards attendant upon any attempt to draw up the outlines of postglacial vegetational history are all in evidence in this paper. They are legion, and appear to be clearly understood by Professor Hansen. The labor of acquiring the materials, preparing the samples, and of securing and analyzing the final data is not the least of these hazards. The proper situation of the various profiles in terms of the chronology of the land surfaces is a difficult problem, and its correctness rests upon a correct interpretation of glacial and postglacial geomorphic events. The incompleteness of our knowledge in this field is evident to anyone who has tried to relate vegetational development to surfaces in glaciated North America.

The identification of pollens is difficult and fraught with many uncertainties. In this country at least, it is yet in the hands of a very small number of those experts who have been willing to devote the large amount of time necessary to learning pollen taxonomy. In spite of a considerable number of published papers on certain groups, there is yet no well-codified knowledge of our native pollens. Until this body of knowledge is developed and organized to the point where it can be used freely by many people, the dissemination of the data on pollen profiles will be very greatly impeded. To this must be added the lack of definitiveness in the identification of species by their pollens. Size-frequency methods are open to criticism on more than one count. The distribution of size-frequency within many species is not known. Likewise the differing effects of the usually rigorous chemical and mechanical treatments given to pollen samples are poorly understood. When size-frequency methods can be checked by size-range studies, as Prof. Hansen has used them, they are obviously much more reliable.

The variable efficiency of preservation among the pollens of different species has long been recognized and cannot be disregarded. The number of species in the northwest coast flora whose pollens are not well preserved is considerable, and one wonders how the interpretations of the profiles would be modified if the relative abundance of these species at different periods were known. At this point, as well as throughout his discussion, Prof. Hansen has to rely upon the assumption that the trees of the Pacific coast forests are reacting to their physical environments and to each other now as they have in all of postglacial time. There is in this assumption the idea that the occurrence and distribution of biotypes within the species has been identical or nearly so throughout the post-Pleistocene. To date, there is no proof of this. On the other hand, there are many suggestions in the studies of Stebbins, Anderson, Hultén, and many others. that notable changes have taken place with the expansion of species populations from Pleistocene refugia and mergence of these populations with others. Prof. Hansen makes no mention of such possibilities in his discussion. Küchler has postulated a biotype depauperation among the hardwoods of the Pacific Northwest during the ice age, but how effective this process was among the conifers is unknown.

Prof. Hansen is to be highly commended for an excellent discussion and a fine contribution to pollen analytical studies in America. He has threaded his way among the difficulties of the subject and its methods with great astuteness, and in spite of them has produced a well-reasoned paper.—Hugh M. Raup.

MINOR TRANSFERS IN PYRUS

M. L. Fernald

It seems to me quite impossible to maintain *Malus* Mill., *Sorbus* L. and *Aronia* Medicus as genera truly distinct on stable morphological characters from *Pyrus* L., unless we are to base our genera on merely local representatives and conveniently to ignore what these groups do in areas not so familiar to us. To those who know *Sorbus* only as it occurs as a series of indigenous trees in North America it is very conspicuously different, in its odd-pinnate leaves, very much branched cyme, and small fruits without grit-cells, from our introduced pears or from the apples, which have simple (though often lobulate) leaves, unforking pedicels, larger fruits with or without grit-cells etc. If we look into the Eurasian representatives of *Sorbus*, however, we shall quickly see that many of its species there have simple leaves, some of them with few (down to 6)-flowered inflorescences, which in fruit have almost simple branches or pedicels. Witness *Pyrus Miyabei* Sargent, illustrated, life-size, in a full-page figure in Garden and Forest, vii. 85, fig. 19 (1894), with leaves suggesting those of *Alnus*, a sparsely branched inflorescence of pear-like or apple-like flowers (shown 1.5 cm. broad) and a little inflorescence of 4 fruits, with deciduous calyx as in *Pyrus baccata* L. or *Malus*